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RESEARCH ARTICLE

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STUDY & IMPROVEMENT OF MECHANICAL PROPERTIES OF CONCRETE USING FIBERS

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ABSTRACT

Concrete made with Portland cement has certain limits. It is relatively strong in compression but weak in tension and tends to be brittle. The weakness in tension can be overcome by the use of conventional rod reinforcement and to some extent by the inclusion of a sufficient volume of certain fibers. The use of fibers also alters the behavior of the fiber-matrix composite after it has cracked, thereby improving its toughness. This leaflet aims to provide information on the properties of the more commonly available fibers and their uses to produce concrete with certain characteristics. Some new developments are discussed.

Fiber-Reinforced Concrete (FRC) results from the addition of either short discrete fibers or continuous long fibers to the cement based matrix. Due to the superior performance characteristics its use by the construction industry has significantly increased in the last 5 years.

Keywords: Fiber, concrete, reinforced, cracks, Property Improvement

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1. INTRODUCTION

1.1 GENERAL

Civil structures made of steel reinforced concrete normally suffer from corrosion of the steel by the salt, which results in the failure of those structures. Constant maintenance and repairing is needed to enhance the life cycle of those civil structures. There are many ways to minimize the failure of the concrete structures made of steel reinforce concrete. The custom approach is to adhesively bond fiber polymer composites onto the structure. This also helps to increase the toughness and tensile strength and improve the cracking and deformation characteristics of the resultant composite.

1.2 SCOPE

1. We can use combination of two or more fibers to improve various mechanical properties of concrete.
2. Use of fibers is economical for big construction projects.
3. Increase resistance of concrete to cracking.

1.3 OBJECTIVES

1. To compare the Strength of normal concrete with the fiber reinforced concrete.
2 .To fix the percentage of fiber to be used for various purposes without affecting workability.

2.METHODOLOGY AND INVESTIGATION

To achieve the objectives mentioned we prefer to use the methodology of comparison.

1.Concrete cubes and beams of commercial grade M-40 will be casted for normal concrete(3+2) and for different volumes of steel(9+6), polypropylene(9+6) and Synthetic(9+6) fibers.

2.Total 50 specimens will be casted for Steel(1%,2%,3%),Polypropylene(0.2%,0.3%,0.4%),Synthetic(0.2%,0.3%,0.4%) fibers based upon mentioned percentages.

Above specimens of concrete will be tested for compressive and flexural strength for 7 and 28 days.

2.1 Literature Survey:

Initially, to understand the problems faced by concrete after being put to use we studied various research papers published by eminent authors. From them the most useful were found to be of **Bayasi.,Z &Zeng., J**who studied polypropylene fiber and concluded that ¼ inch long fibers were more effective.**Ashour , S.A &Wafa , F.F** who concluded that steel fiber were more resistance to flexural stiffness and improve ductility of beam.

2.2 Methodology:

While conducting the various test fiber matrix interaction, conditions for using fibers and properties of fiber were studied and 3 were used in tests.

2.3Fibers & their types

1.Glass fiber
2.Steel fiber
3.Synthetic fiber
4.Aramid fiber
5.Polypropylene fiber
6.Natural fiber etc.

2.3.1 Steel Fiber –

Steel fibers can:-

- Improve structural strength.
- Reduce steel reinforcement requirements.
- Improve ductility.
- Reduce crack widths and control the crack widths tightly, thus

improving durability.

- Improve impact– and abrasion–resistance.

2.3.2 Polypropylene fibers-

- Polypropylene fiber can-
- Improve mix cohesion, improving pump ability over long distances.
- Improve freeze-thaw resistance.
- Improve impact resistance.
- Increase resistance to plastic shrinkage during curing

2.4 Factors affecting Fiber reinforced concrete(FRC)

Major factors affecting FRC are-

- Volume of Fiber
- Aspect Ratio of the Fiber
- Orientation of Fiber
- Workability and Compaction of Concrete
- Size of Coarse Aggregate

Depending on these steel, polypropylene and synthetic fibres were chosen considering their properties and economy.

2.5 MIX DESIGN

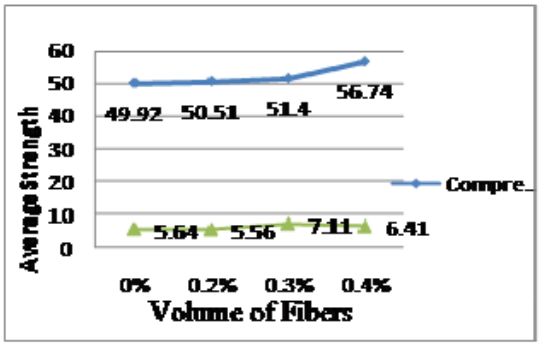
CONTENT	QUANTITY FOR 1 CU.M
Cement	365 Kg/Cu M
Water-cement	0.37
Fly Ash	85 Kg/Cu M
Crushed Sand	819.37 Kg/Cu M
10 mm Aggregate	419.73 Kg/Cu M
20 mm Aggregate	635.03 Kg/Cu M
Admixture (H.R Johnson)	3.6 Kg/Cu M

Using IS CODE 10262 design was decided considering the advice of experienced people and experts guidance.

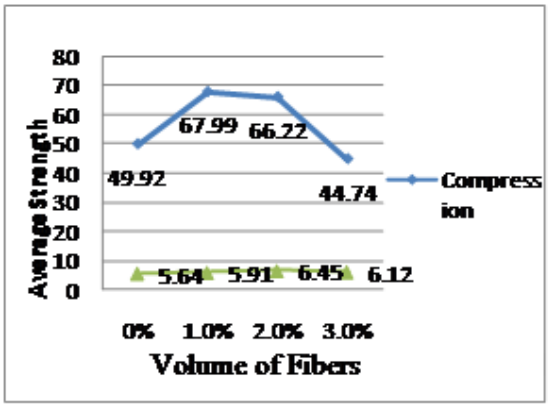
Design was decided for 1 cubic meter of concrete

3.RESULT

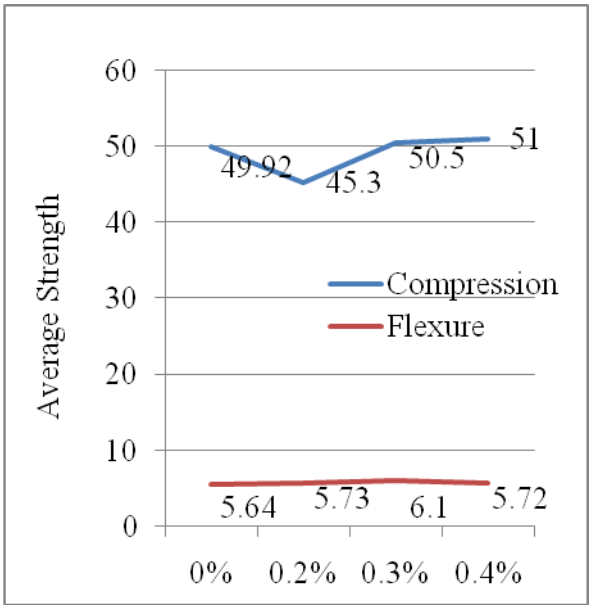
3.1 Strength Analysis Of Polypropylene Fiber Reinforced Concrete For 28 Days



3.2 Strength Analysis of Steel fiber Reinforced Concrete For 28 Days



3.3 Strength Analysis of Synthetic Fiber Reinforced Concrete For 28 Days



4. CONCLUSION

1.From graph A , It is clear that 1% of steel fiber gives maximum compressive strength whereas 2% gives maximum flexural strength.

2.From graph B, It is clear that 0.4% of polypropylene fibers gives maximum compressive whereas 0.3% gives maximum Flexural Strength.

3.From graph C, It is clear that 0.4% of synthetic fiber gives maximum compressive strength whereas 0.3% gives maximum flexural strength.

- With increasing negligible cost fibers increases considerable properties of concrete.

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